
# Environmental impact assessment (EIA) guidance for developers at the European Marine Energy Centre

# Contents

## Important preliminary note

These guidelines have been developed in response to queries about EIA requirements from developers interested in testing their marine energy conversion devices at EMEC, which has already been the subject of a full-scale EIA.

The purpose of the guidelines is to encourage and assist developers to consider as fully as possible the range and scale of impacts that might result from the testing of their device/s at EMEC.

It is incumbent on developers to ensure the full compliance of their devices and operations with legislative requirements.

# 1 Introduction

## 1.1 Background and context

The European Marine Energy Centre (EMEC) already has, or is in the process of obtaining consent for the location and operation of the wave and tidal test sites within Orkney. There is a requirement under some of the consent conditions for EMEC to provide relevant authorities with details of technologies to be tested within its test areas (see Figure 1.1). In addition, EMEC requires developers to demonstrate the consideration of environmental issues in the planning, design, deployment and decommissioning of test devices and to summarise the results of this process in an Environmental Statement (ES)[1].

EMEC, as the first centre of its kind in the world, and as one of the leading organisations in the testing of commercial scale wave and tidal technologies, recognises the importance of establishing high standards for environmental performance and an early understanding of the range and significance of potential environmental impacts. This will ensure the marine energy industry considers environmental implications of its projects/technologies in the early stages of design and development, leading to best practice being carried forward into commercial scale developments.

EMEC operates an Integrated Management System (IMS), which demonstrates a clear commitment to the standard of quality, health, safety and environmental (QHSE) management. The system has been developed to meet the requirements of the internationally recognised environmental standard, ISO 14001, to ensure the highest standard of environmental performance from employees, developers and those visiting the centre.

During the development of this Environmental Impact Assessment (EIA)[1] guidance, EMEC consulted with a range of statutory and non-statutory stakeholders to ensure that it would meet their expectations and facilitate the timely review of proposed test site operations.

## 1.2 Legislative and consent requirements

EMEC has in place the following general consents and exemptions:

- The Coast Protection Act 1949 - consent to locate.
- The Food and Environment Protection Act 1985 Part II (Deposits to Sea) - licence for deposits in the sea.
- The Electricity Act 1989 (Requirement for Consent for Offshore Generating Stations) (Scotland) order 2002 (SSI 2002/407) – exemption under Section 36 of the Electricity Act (pending).
- Seabed lease from the Crown Estate.

Developers are responsible for ensuring regulatory compliance of operations outwith EMEC facilities.

## 1.3 Activities outwith EMEC test sites

Although EMEC does not have any responsibility for offsite activities undertaken by developers, as stated above it recognises the importance of establishing high standards for environmental performance. It therefore encourages developers to consider the impacts associated with their activities outwith the EMEC test areas and to promote high standards in all aspects of their operation.

The table in Appendix I indicates the type of activities that should be considered and EMEC would encourage developers to consult with appropriate stakeholders, depending on the scale and nature of offsite operations.

[1] Environmental Impact Assessment (EIA) is the process of identifying, assessing and developing appropriate mitigation and management for potential environmental impacts. The Environmental Statement (ES) is the document produced to summarise the EIA process.

Although not specifically required by EMEC, developers are encouraged to follow the same EIA process for offsite activities/operations as for test site activities/operations.

## 1.4 Timing of scoping and ES submission

Scoping information as outlined in Section 2.2 should be supplied to EMEC as soon as possible after expressing an interest in using EMEC facilities.

It is recommended that developers submit their ES to EMEC 3-6 months prior to device deployment on site, to allow time for EMEC consideration, consultation and working through of any clarifications/issues. This will also allow sufficient time for commitments made in the ES to be implemented prior to devices being deployed onto test berths.

**Figure 1.1 Test site areas covered by the EIA guidance**

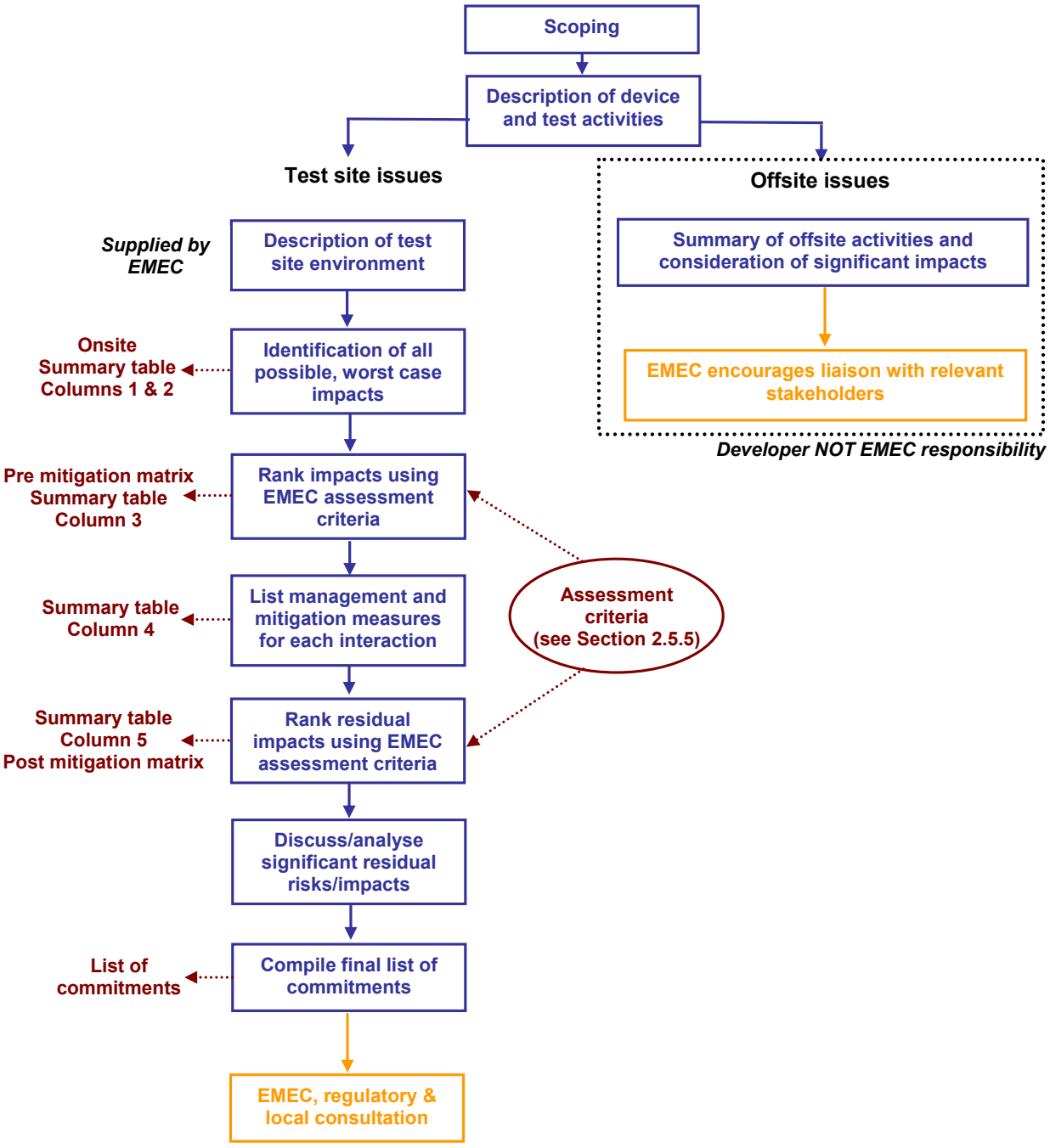
### 1.1 a) Wave test site

# 2 Environmental impact assessment process

## 2.1 Introduction

The EMEC EIA process is summarised in Figure 2.1. The process follows a sequential series of steps starting with initial scoping. The full EIA process then starts with a description of the proposed activities and the site environment. The possible environmental interactions are then identified and the scale of potential impacts established. The bases for management and mitigation are then identified and predictions of anticipated residual impacts made. The final stage is to compile a list of commitments for the project. This package can then be used by EMEC to meet its own regulatory commitments.

**Figure 2.1 Summary of environmental impact assessment process**



## 2.2 Environmental scoping

To ensure the early identification of key potential impacts, developers should provide outline project information to EMEC for its consideration. Typically this would include:

- Picture/drawings of the device and its dimensions (approx);
- Principle construction materials;
- Proposed device location;
- Outline description of installation, operation and decommissioning; and
- Preliminary analysis of the main environmental impacts/risks.

## 2.3 Content of the Environmental Statement

EMEC has developed these guidelines to help developers meet the expectations of the regulators, stakeholders and EMEC on environmental stewardship. The approach is based upon the production of a concise Environmental Statement (ES) document, which demonstrates consideration of all potential impacts focusing the discussion on the issues of particular environmental importance/significance. One of the key purposes of the ES is to provide a comprehensive and transparent account of the decision making process and importantly the outcome that has arisen. It is important that the information provided is comprehensive and is the best information available at the time, but that it also concentrates upon the issues that have the potential for environmental impact or are of concern for the regulators, stakeholders and EMEC.

As a minimum the document should contain the following:

- Non-technical summary;
- Environmental description;
- Basis for design (environmental and other factors that have been taken into account in the design specifications);
- Device description (including consideration of logistics and support requirements);
- Summary of the EIA process and justification of impacts considered potentially significant; and
- List of all commitments made by the developer to ensure negative environmental impacts are minimised and possible benefits optimised.

Developers should provide details, in the ES, of any baselines studies, monitoring and other measurements they have undertaken or plan to undertake. To ensure consistency and comparability of data collected, it is important that environmental monitoring plans are developed in liaison with EMEC and further guidance on environmental monitoring will be provided separately to this guidance. ***Developers should be aware that monitoring requirements may be stipulated in licence/consent conditions.*** Also it should be noted that as new legislation is developed and implemented, there may be additional monitoring requirements.

The following sections of this document provide guidance on the level of detail required in each section of the report, together with a recommended method for impact assessment. Developers are required to use the recommended methodology to allow a standardised approach[2] to the device review process, leading to an efficient and timely processing of the ES document by EMEC.

Each developer is required to compile a list of commitments made to manage and mitigate/minimise impacts. The commitment list will be monitored by EMEC.

## 2.4 Environmental description

A comprehensive environmental description of the relevant EMEC test site(s), detailing key senstivities (receptors), has already been prepared and is provided in a separate document. This collates all existing

[2] It is expected with experience that the impact assessment methodology will be developed and revised as required, and this guidance updated.

information and also highlights any further data which EMEC is in the process of gathering. This can form the basis of the environmental description presented in the ES document. The description will be periodically updated as information becomes available and developers are asked to contribute any suitable information they gather, through their activities, for this purpose.

**Basis of design**

Although the EIA process focuses upon the impacts of the development on the environment, it should also take into account how the environment could impinge upon technology or activities proposed. The details of the environmental conditions that have been taken into account in establishing the design of the device and anchoring system, and operational plans should be outlined in the basis of design. Any gaps or uncertainties should be identified and communicated to EMEC.

## 2.5 Project description

The developer is required to provide a comprehensive description of their device(s) and associated activities, with particular focus on the issues that are important from an environmental perspective. This description should be in layman's terms and easily understood by someone not familiar with specialist terminology.

Table 2.1 provides guidance on the type of information that should be provided, including reporting units/measurements for specific parameters. The table should not be considered an exhaustive list and if there are issues you feel are important from an environmental perspective please include details of these.

The table also highlights the key impact issues associated with different aspects of devices. Further details on all the impacts that should be considered by developers and the reasons why they are important are provided in Table 2.2.

**Table 2.1 Project description details**

| Device | What needs to be described | Key impact issues (Plus reference numbers linked to Table 2.2) |
|---|---|---|
| Developers management system/structure | • Location of key personnel/decision makers.<br>• Communication plan with EMEC. | • Ensuring right mechanisms in place for efficient, effective and timely decision making |
| Testing schedule | • Timing and length of test activities (start date, finish date, any non work periods, including any plans to temporarily remove device (if known)). | • Seasonal variation in environmental sensitivities /impacts (19) |
| Device structure and operation | • General description (include pictures / photos of device showing in and out of water profiles).<br>• Full dimensions (metres).<br>• Weight (tonnes).<br>• If sub surface, depth below sea surface, i.e. draft (metres) and height above seabed (metres relative to lowest astronomical tide (LAT)).<br>• Physical dimensions in all operational modes.<br>• Potential for scour induced by or around device.<br>• Location of device within test berth e.g. central, off centre, orientation with regard to current/waves (lat long of centre and radius of reach).<br>• Description of how devices function operationally. | • Sensitivity of seabed habitats to scour (2)<br>• Behavioural interactions with wildlife (6)<br>• Potential for wildlife entanglement/entrapment/collision (9)<br>• Visual and landscape impacts (14)<br>• Navigational/sea user interference (18)<br>• Suitability of device for local environment (19) |
| Mooring or foundation system | • General description to include but not be limited to:<br>o Size (m, tonnes), area of coverage ($m^2$), depth of seabed penetration (m), installation method (description), materials (tonnes), movement of device around moorings (deviation from test berth centre m).<br>• Chains, anchors, blocks, subsea connections, piles etc. | • Sensitivity of seabed habitats to scour (2)<br>• Disturbance to water masses (3)<br>• Seabed damage/disturbance – habitat importance (2, 4, 7) |

| Device | What needs to be described | Key impact issues (Plus reference numbers linked to Table 2.2) |
|---|---|---|
| | • Clump weight requirements.<br>• Potential for scour induced by or around moorings.<br>• Mooring buoys (position (lat long), number, colour, lighting, mass, materials, markings, tether arrangements).<br>• Seabed preparation ($m^2$), depth of excavation (m).<br>• Drilling requirements (narrative including detail of any drilling fluids and discharges and timing of operation).<br>• Piling requirements (narrative of piling operation and timing of operation).<br>• Foundation construction (materials, mass).<br>• Vessel requirements (expected vessel GRT, length, draft etc). | • Leaching of concrete etc (8)<br>• Potential for wildlife entanglement/entrapment/collision (9)<br>• Noise – piling/chains (10, 11)<br>• Navigational/sea user interference (18) |
| Installation requirements | • Description of installation process, including pre installation requirements (narrative).<br>• Vessel requirements (expected vessel GRT, length, draft etc).<br>• Generation of onsite waste/litter ($m^3$ or tonnes for each type of waste).<br>***Note: EMEC requires a formal device specific installation plan before the device can be deployed on site.*** | • Seabed damage/disturbance – habitat importance (2, 4, 7)<br>• Noise (10,11)<br>• Navigational/sea user interference (18)<br>• Timing of operations (20) |
| Power requirements | • Details of power requirements, including requirement for and location of any external power sources (narrative).<br>• Diesel or other fuel requirements including inventory (litres), bunkering procedures and regularity etc. | • Contamination of water, seabed and wildlife (8)<br>• Local air quality issues (15) |
| Materials | • Inventory of materials ($m^3$ or tonnes) e.g.:<br>o Metal – conforms to international standards.<br>o Plastics<br>o Seals.<br>o Greases and lubricants (litres).<br>o Oil types and inventories (e.g. hydraulic, transformer etc) (litres).<br>o Paints (litres) and description of types.<br>o Adhesives (litres) and description of types.<br>o Batteries (e.g. back up system).<br>o Ballast - (tonnes, type of material and source location).<br>• Chemical requirements/treatments (names and function and quantity in litres).<br>• For all materials provide details of compliance with a recognised international (ISO or equivalent) standard. | • Contamination of water and wildlife (8)<br>• Hazardous substances (8)<br>• Waste disposal issues (17)<br>• Materials released in the event of an accident/failure (8, 21) |
| Hydraulic systems | • General description of hydraulic systems to include oil requirements, containment, potential discharge etc (litres per day). | • Contamination of water and wildlife (8)<br>• Noise of system (10, 11) |
| Corrosion protection | • General description of corrosion protection to include any sacrificial anode requirements, composition and replacement schedule etc. | • Contamination of water and wildlife (8) |
| Antifouling system | • Type of antifouling system – including compliance with any recognised international/national standards (narrative).<br>• Covers what surface area of device ($m^2$)<br>• How frequently does system need to be | • Contamination of water and wildlife (8)<br>• Waste disposal issues (17) |

| Device | What needs to be described | Key impact issues (Plus reference numbers linked to Table 2.2) |
|---|---|---|
| | reapplied/replaced (application rate per year).<br>• If no antifouling system how will fouling (e.g. marine growth, bird guano etc) be managed/removed? (narrative). | |
| Power conversion system | • General description of power generation module/generator, including number and arrangement of modules and mechanisms for power extraction, e.g. propeller, buoyancy, venturie (narrative).<br>• Device generation capacity - design power output profile (kW).<br>• Swept area (surface area in $m^2$ and water depth range in metres).<br>• Energy capture area ($m^2$, joules) and proportion of energy flux (as percent of local and overall flux).<br>• Frequency/speed of moving parts (cycles per minute). | • Energy balance in marine environment – potential habitat changes (offshore and coastal), both direct and indirect (1, 4)<br>• Seabed impacts (2)<br>• Water column impacts (3)<br>• Noise (10, 11) |
| Noise and vibration levels | • Frequency of any noise generated (Hz).<br>• Amplitude in (dB re 1μPa@ 1m in water or dB re 1μPa@ 20m in air) of device as whole or different parts of device.<br>• If no data available provide details of dynamics of all moving parts of the device (e.g. bearings, pistons, pressurised systems, motors, gearboxes, pumps, rotors, air turbines, wildlife scaring devices etc) list of parts and any noise data.<br>• Details of any tensioned wires or other components that could resonate in water (resonant frequency).<br>• Details of any vibrating systems (narrative). | • Underwater noise effects on wildlife (10)<br>• Surface noise effects (11) |
| Device marking | • Above surface visibility (diagram, metres above water line).<br>• Colour (description and photo).<br>• Lighting arrangements (distance of visibility, flashing sequence etc).<br>• Low visibility warning signals e.g. fog horns, radar reflectors.<br>• Device stationing verification (narrative).<br>• Possible device failure modes e.g. floating, sinking, fire, collapse (narrative).<br>***Note: Consult with the Northern Lighthouse Board (NLB) to determine device marking requirements*** | • Visual and landscape (14)<br>• Avoidance of pollution/leaks (8, 21)<br>• Navigational/sea user interference (18) |
| Electrical systems | • Voltage (volts) and current (amps) patterns from generated power in umbilical.<br>• Impressed currents corrosion systems (narrative).<br>• Frequency (Hz) and harmonics of any electric currents.<br>• Lightning protection (narrative). | • Effects on marine life (6) |
| Heating and cooling systems | • Water abstraction and discharge requirements (narrative).<br>• Chemical requirements/treatments (names, functions and quantities in litres). | • Water column impacts (abstraction and heating) (3)<br>• Contamination of water and wildlife (8)<br>• Dense sea life populations at certain times of the year (1, 20) |
| Communication systems | • General description of device communication systems (narrative) e.g. fibre optic, high energy radio antennae, microwaves, wireless LAN etc. | • Shipping radio, radar and MOD interference (19) |

| Device | What needs to be described | Key impact issues (Plus reference numbers linked to Table 2.2) |
|---|---|---|
| | • Licence arrangements.<br>• Frequency (Hz) and amplitude of signals. | |
| Shore connections | • Details of any shore connections e.g. cables and pipelines, required additional to those provided by EMEC (narrative).<br>• Electromagnetic and electrical fields from any cables (strength, frequency and wavelength). | • Seabed and landfall impacts (2, 4, 5)<br>• Electromagnetic and electrical effects (12)<br>• Public awareness and perception |
| Shore facilities | • Details of any facilities required additional to those provided by EMEC (narrative). | • Habitat disturbance/damage (4, 5)<br>• Conservation importance/potential impacts on protected species (7)<br>• Land/facility use etc (5, 14)<br>• Noise, light, other nuisances (11) |
| Energy storage | • Details of energy storage requirements (narrative). | • Potentially complex operation with a series of impacts – needs to be considered in it own right. |
| Energy sink | • Details of energy sink requirements (narrative). | • Potentially complex operation with a series of impacts – needs to be considered in it own right. |
| Chemical use and management | • Details of chemical management system (narrative).<br>• List of all chemicals (including alternatives considered) – why required and how used (narrative), including potential for discharge (litres per month).<br>• Provide MSDSs (Material Safety Data Sheets) and any ecotox data for all proposed chemicals.<br>• Spill prevention strategy/measures (narrative). | • Contamination of water and wildlife (8)<br>• Waste disposal issues (17) |
| Potential discharges to sea | • Details of any systems/components that will discharge/leach etc into the marine environment (e.g. bilges, hydraulic fluids, sacrificial anodes, sewage etc, including estimate of discharge/leaching rate litres per year). | • Contamination of water and wildlife (8) |
| Potential discharges to air | • Details of any systems/components that will result in atmospheric emissions e.g. combustion emissions, vented gases etc to include emissions from device and support vessels (narrative).<br>• Annual total emissions (tonnes) for all greenhouse gases – reported in $CO_2$ equivalents.<br>• Emissions with potential impacts on air quality (e.g. nitrogen and sulphur oxides, BETX etc). | • Local quality issues (7, 15)<br>• Contribution to greenhouse gas processes (13) |
| Maintenance requirements | • Description of likely maintenance requirements, how often required, what needed to support maintenance operations, (narrative) to include:<br>o Are operations to be contained within devices test berth area (including anchors/mooring lines)?<br>o Frequency of vessel operations onsite (if known, vessel numbers and frequency/timing of visits).<br>o Anchoring requirements of support vessels (anchor etc and length of chains, radius of mooring facilities etc).<br>o Onsite requirements e.g. utilities (periodically used by maintenance personnel).<br>o Any requirements for seabed maintenance (e.g. dredging or scour protection).<br>• Potential for generation of onsite waste/litter ($m^3$ or tonnes) and disposal methods. | • Seabed disturbance and damage (2)<br>• Contamination of water and wildlife (8)<br>• Noise (10,11)<br>• Waste disposal issues (17)<br>• Navigational/sea user interference (18) |

| Device | What needs to be described | Key impact issues<br>(Plus reference numbers linked to Table 2.2) |
|---|---|---|
| | • Debris recovery ($m^3$ or tonnes) and disposal method. | |
| Decommissioning | • General description of device and mooring recovery/ removal activities/requirements (narrative) to include:<br>o Are operations to be contained within devices test berth area (including anchors/mooring lines).<br>o Vessel/other requirements (expected vessel GRT, length, draft etc).<br>o Anchoring requirements of vessels.<br>o Cutting/removal techniques for any imbedded structures.<br>o Onsite requirements e.g. utilities (periodically used by maintenance personnel).<br>o Potential for generation of onsite waste/litter ($m^3$ or tonnes) and disposal methods.<br>o Debris survey details, recovery and disposal.<br>o Seabed reinstatement requirements.<br>o Provisions for decommissioning bond.<br>***Note: EMEC requires a formal device specific decommissioning report. Timing of submission will depend on test period.*** | • Seabed disturbance and damage (2)<br>• Contamination of water and wildlife (8)<br>• Surface, noise, light and other nuisances (11)<br>• Waste disposal issues (17)<br>• Navigational/sea user interference (18) |
| Environmental monitoring | • Any plans for device specific environmental monitoring – provide outline details of what is planned (narrative).<br>***Note: There may be monitoring requirements by consenting bodies, depending on nature of device (to be developed in liaison with EMEC).*** | • Add to understanding of device interactions/environmental processes |
| Accidental events | • Description of accidental/emergency situations which may result in interference with other sea users and environmental pollution, to include assessment of likelihood and scale of consequence of each event (narrative).<br>• Spill prevention strategy/measures (for oils and chemicals).<br>• Outline of response procedures for possible device failure modes and dropped objects.<br>• Details of insurance in place (details of policies and monetary limits).<br>***Note: EMEC requires a full hazard identification and risk assessment to be carried out prior to any activity.*** | • Habitat disturbance and damage (2)<br>• Contamination of water and wildlife (8)<br>• Potential for wildlife entanglement/entrapment/collision (9)<br>• Navigational/sea user interference (18)<br>• Public awareness and perception |

## 2.6 Environmental impact assessment

### 2.6.1 Key issues

Table 2.2 explains why the various issues outlined in this document are of concern. It should be used as a checklist to ensure that all potential impacts from the devices and associated operations have been assessed. It should not be considered an exhaustive list and if there are other issues that are important from an environmental perspective they should be included in the assessment.

The issues identified in Table 2.2 are the mechanisms by which impacts can occur. When producing the summary matrices in the ES (see Section 2.5.3 and Appendix III) potential impacts must be judged against receptors (i.e. as listed across the top of the table in Appendix III).

**Table 2.2 Ecological & socio-economic issues**

| Issue | What should be considered/ Why it is important? |
|---|---|
| **Ecological issues** | |
| 1. Ecological energy balances and flows | Consequence of energy extraction and physical presence of devices in the sea should be assessed, e.g. changes in vertical mixing, may lead to changes in offshore and coastal habitats/features and knock on effects to biological communities present (see 7). |
| 2. Disturbance to seabed habitats | Anchoring, mooring/foundation installation, operation and maintenance equipment and other seabed disturbances can lead to disturbance/destruction of seabed habitats. |
| 3. Disturbance to water masses | The scale and implications of changes to such factors as nutrients, temperature, light levels, turbidity (suspended sediments), surface waves and current patterns should be considered. |
| 4. Shoreline disturbance | Activities that have the potential to cause change to the coastline such as erosion/deposition, change in character, either directly or indirectly should be considered. |
| 5. Disturbance of landward areas | Siting of any onshore activities/works should avoid onshore habitats important from a conservation perspective and minimise the loss of natural habitat. |
| 6. Behavioural changes in wildlife | Test activities have the potential to affect the distribution of wildlife. The potential influence of activities and facilities upon wildlife, in particular those protected by European Directives and national legislation (also see issue 7) should be considered. |
| 7. Impacts on conservation areas/protected species | Any interference with designated conservation areas and protected species, of international, national and local significance should be considered. |
| 8. Contamination of water, seabed and wildlife (inc fish stocks) | Contamination may result from effluent discharge, chemical discharge/leaching/leaks, oil discharge/leaks, sewage discharge, dumping of waste etc. All potential sources, planned or accidental should be considered. |
| 9. Wildlife entanglement, entrapment and collision | The potential for damage and entrapment of wildlife in particular marine invertebrates, fish, mammals and birds, should be addressed in relation to structure, operation, season, and location. Impacts may include entanglement or collision with any blades/rotors, jamming in joints, entrapment etc. |
| 10. Underwater noise, light and vibration | Test devices and associated activities are likely to give rise to noise, light and other disturbances that may disturb and affect the behaviour or the well-being of marine life. Although the exact cause and effect relationships can be difficult to determine, there is keen interest in this issue with regulators and stakeholders. |
| 11. Airborne noise, light and other nuisances | Airborne noise, light and other nuisances can affect wildlife (potentially offshore, coastal and onshore) and impinge upon coastal resident communities and recreational activities. |
| 12. Electromagnetic and electrical effects | Some organisms e.g. elasmobranchs fish (sharks, rays and skates), are particularly sensitive to electric and electromagnetic fields generated from electric cables. |
| 13. Greenhouse gas emissions | Consideration should be given to potential greenhouse gas emissions e.g. from fuel use etc. |
| **Socio-economic issues** | |
| 14. Visual and landscape impacts | Devices visible from the coast and at sea may affect the landscape qualities of particular views. Factors (within navigational requirements) that help structures blend in with or enhance the landscape are important. This can include colour, orientation, structural design, materials etc. Consider visibility distance of lights and ensure compliance with |

| Issue | What should be considered/ Why it is important? |
|---|---|
| | NLB requirements/recommendations. |
| 15. Local air quality issues | Any emissions of combusted or vented gases have the potential to reduce air quality. |
| 16. Interference with communication systems | Some device to shore communications could interfere with normal shipping communications. |
| 17. Waste minimisation and disposal | All efforts should be made to minimise waste. Ensure suitable storage, transport and disposal for all waste streams. Some wastes will be able to follow existing waste disposal routes, others may not. |
| 18. Navigation/sea user interference | The presence of devices and their mooring systems has the potential to interfere with vessels and other sea users e.g. fisheries. Although test berths will generally be avoided by such activities, they are not 'exclusion zones' and therefore such impacts need to be considered. |
| **Overall management issues** | |
| 19. Suitability of the device for local environmental conditions | Ensure full consideration of local environmental conditions during design of devices and mooring systems. |
| 20. Timing of activities regarding seasonal sensitivities | An assessment of seasonal sensitivity is an integral aspect of the EIA and timing of activities should be considered within overall mitigation and management plan. Specific seasonal sensitivities are summarised in the test site environmental descriptions (provided separately). |
| 21. Accidental spillages and releases | Spillages of materials to sea have the potential to cause damage to wildlife and livelihoods e.g. fisheries. Appropriate procedures for accidental/emergency situations should be in place to minimise the potential for accidental releases. |

### 2.6.2 Impact evaluation

The assessment should be summarised in the tabular format as detailed in Appendix II. This will help to control the volume of work undertaken whilst maintaining its comprehensiveness. The requirements for filling in the table presented in Appendix II are outlined below:

- Developers should identify what activities have the potential to cause impacts in column 1 of the table. The exact terminology for describing the activities listed in column 1 will be specific to each project, but the range of activities addressed should be guided by the activities listed in Table 2.1.

- The basis for these impacts, including the mechanism involved and the environmental component affected, should be described in column 2 of the summary table. It should be noted that there may be more than one mechanism and affected component for each activity. ***It is important that in column 2 of the table developers make an attempt to quantify the significance of impact using the criteria provided in Section 2.6.5, e.g. extent and intensity that they expect, and that they identify any seasonal variations in impacts based on the site specific environmental sensitivities. Where appropriate, monitoring (developed in liaison with EMEC) should be used to verify predictions made.***

- The level/significance based on the defined criteria (see Section 2.6.5) assuming a worst case impact, i.e. with no management or mitigation measures in place, should be entered into column 3 of the summary table. Where there are uncertainties in the significance of impact these should be noted.

- Following this, developers should identify management and mitigation measures that will be employed against each issue and list these in column 4 of the summary table.

- This will in turn allow assessment of the residual impacts that are anticipated to arise following implementation of these management and mitigation measures. Residual impacts should be rated using the same criteria as used earlier for the possible unmitigated impacts. The results should be entered into column 5 of the summary table.

### 2.6.3 Summary impact matrices

Summary matrices should also be produced which give an overall picture of the potential pre-mitigation impacts and residual impacts. The format of these matrices is provided in Appendix III. The exact terminology for describing the activities listed in the left hand column should match that used in column 1 of the summary impact table.

### 2.6.4 Discussion of significant residual impacts

Any potential residual impacts, ranked as moderate or major should be discussed in more detail in the main text of the ES document. Where a significant potential impact is being discussed the aim is to outline a case explaining, and as far as possible justifying, why the proposed activity is required. This description should highlight why the impact is potentially significant, the scale of impacts that could arise under different circumstances if appropriate, possible mitigation principles and the level of residual impacts that could be expected. The assessment should consider positive as well as negative aspects arising from activities.

This need not, however, be a highly detailed thesis and on most occasions a well argued and presented case will be of more value than pages of spurious data. The key factors are to understand why an issue is of concern/interest and to address this specifically in the case put forward. This logic applies to positive benefits as well as negative impacts. Where there is established literature or case history this should be highlighted and referenced.

***It can be expected that for any potentially significant impacts there will be a requirement to develop and implement appropriate monitoring programmes. Any such monitoring programmes should be developed in liaison with EMEC.***

Minor and negligible impacts must still be considered and the proposed management and mitigation measures included and tracked within the commitments list (see Section 2.6.6). The comments within the summary table should generally be sufficient to address these issues.

### 2.6.5 Criteria to be used to assess environmental impact

The following definitions should be used to categorise potential and residual impacts (i.e. columns 3 and 5 in the summary table):

| | Ecological effects | Socio-economic effects | Stakeholder concerns | Consequence for developers |
|---|---|---|---|---|
| **Major** | Degradation to the quality or availability of habitats and/or wildlife with recovery taking more than 2 years<br><br>*(e.g. widespread seabed excavations, erosion)* | Change to commercial activity leading to a loss of income or opportunity beyond normal business variability/risk<br>Potential short term effect upon public health / well-being, real risk of injury<br>*(e.g. loss of important fishery area, dive site, creation of seabed or floating debris)* | Concern leading to active campaigning locally or wider a field<br><br>*(e.g. current national wind farm applications)* | Introduce measures to avoid these impacts wherever possible, closely monitor and control areas of residual impact |
| **Moderate** | Change in habitats or species beyond natural variability with recovery potentially within 2 years<br><br>*(e.g. seabed excavations in a small area)* | Change to commercial activity leading to a loss of income or opportunity within normal business variability/risk<br>Possible but unlikely effect upon public health/well-being. Remote risk of injury<br>*(e.g. small exclusion area away from or small part of actively used areas)* | Widespread concern, some press coverage, no campaigning<br><br>*(e.g. local small scale wind developments)* | Actively work to minimise scale of impacts |

| | Ecological effects | Socio-economic effects | Stakeholder concerns | Consequence for developers |
|---|---|---|---|---|
| **Minor** | Change in habitats or species which can be seen and measured but is at same scale as natural variability<br><br>*(e.g. low level noise from devices)* | Possible nuisance to other activities and some minor influence on income or opportunity. Nuisance but no harm to public<br><br>*(e.g. short term congestion at harbours)* | Specific concern within a limited group<br><br>*(e.g. underwater noise affects on cetaceans)* | Be aware of potential impacts, manage operations to minimise interactions |
| **Negligible** | Change in habitats or species within scope of existing variability and difficult to measure or observe<br><br>*(e.g. localised avoidance of structures by wildlife)* | Noticed by but not a nuisance to other commercial activities. Noticed by but no effects upon the health and well-being of the public<br><br>*(e.g. additional shipping at sea)* | An awareness but no concerns<br><br>*(e.g. exclusion of sea user group from non-critical sea areas)* | No positive intervention needed but ensure they do not escalate in importance |
| **No interaction** | None | None | None | Ensure changes to activities do not lead to new impacts |
| **Positive** | An enhancement of ecosystem or popular parameter<br><br>*(e.g. enhance biodiversity, save in $CO_2$ emissions)* | Benefits to local community<br><br>*(e.g. contract to use local skills and expertise on a project)* | Benefits to stakeholder issues and interests<br><br>*(e.g. prospects of new jobs and local spending)* | Actively work to maximise specific benefits |

### 2.6.6 List of commitments

The developer should summarise all commitments made in the ES in a commitments table/register. The format for this is provided in Appendix IV. This will be monitored by EMEC to ensure that all commitments made in the ES are carried through to implementation and have been executed before the prototype is deployed on site.

Some of the commitments made by the developer may be reflected in the final design of the prototype. The implementation date for such commitments will be the date of the final engineering documentation.

# 3 Bibliography and references

*The following will provide some useful background/reference for environmental impact assessment for marine renewable energy projects. The list will be added to as and when new publications become available.*


ABPmer (2005). Potential nature conservation and landscape impacts of marine renewable energy developments in Welsh Territorial Waters. CCW policy research report No. 04/8.

CEFAS (2001) Offshore wind farms: Guidance note for Environmental Impact Assessment in respect of FEPA and CPA requirements.

CEFAS website: http://www.cefas.co.uk/renewables/Default.htm

CMACS (2003) A baseline assessment of electromagnetic fields generated by offshore windfarm cables. COWRIE Report EMF - 01-2002 66.
http://www.thecrownestate.co.uk/15_our_portfolio_04_02_16/33_energy_and_telecoms_04_02_09/34_wind_farms_04_02_07/35_cowrie_04_02_07/35_cowrie_electromagnetic_fields_04_02_07.htm

COWRIE website: www.thecrownestate.co.uk

Davies J, Baxter J, Bradley M, Connor D, Khan J, Murray E, Sanderson W, Turnbull C and Vincent M *eds* (2001). Marine monitoring handbook. Natura 2000. UK marine SACs project. Joint Nature Conservation Committee, Peterborough.

DEFRA is presently conducting two research projects; the reports will become available at the end of March 2005:

- (AE0262) Development of Generic Guidance for Sediment Transport Monitoring Programmes in Response to Construction of Offshore Wind Farms; and
- (AE1227) Assessment of the Significance of Changes to the Inshore Wave Regime as a Consequence of an Offshore Wind Array.

DTI Noise Project: http://www.og.dti.gov.uk/environment/callprop2.htm

Gill AB and Taylor H (2001). The potential effects of electromagnetic fields generated by cabling between offshore wind turbines upon Elasmobranch Fishes. CCW Science Report No 488.

Hiscock K, *ed.* (1996). Marine nature Conservation Review: rationale and methods. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom MNCR series).

MCA Marine Guidance Note (MGN) 275. Proposed UK offshore renewable energy installations (OREI) guidance on navigational safety issues. Published August 2004.

Scottish Natural Heritage (2004). Marine renewable energy and the natural heritage: an overview and policy statement. SNH policy statement 04/01. Available on the SNH website.

Scott Wilson and Downie, AJ (2003). A review of possible marine renewable energy development projects and their natural heritage impacts from a Scottish perspective. Scottish Natural Heritage Commissioned Report F02AA414.

# Appendix I Considerations for activities outwith EMEC facilities

Orkney has a wide range of resources and services available to support developer test activities and wherever possible developers are encouraged to make use of these.

If developers take advantage of the resources and services available, they are encouraged to consider potential offsite environmental effects. Issues that should be considered include those listed in the table below (the table should not be considered to be an exhaustive list).

| Offsite | Issues to be considered |
|---|---|
| Construction and fabrication | • Location of fabrication. |
| Standby, support, offsite maintenance and decommissioning requirements | • Areas/locations required e.g. offsite mooring, harbour/pier facilities (timing and duration requirements for these facilities).<br>• Vessel requirements e.g. number, size (GRT, draft etc) duration, timing (i.e. months) etc.<br>• Details of any onshore facilities required additional to those provided by EMEC e.g. lay down areas (devices and supplies), workshops, crane access, slipways, offices (including requirements at decommissioning).<br>• Requirements in event of emergency including vessel requirements, mobilisation times etc. |
| Personnel requirements | • Numbers of people, time of visit, length of stay etc. |
| Tow to site | • Draft during tow, vessel requirements (number and size), speed during tow (knots/$ms^{-1}$), proposed route (description), manoeuvrability (e.g. length of tow etc). |
| Temporary docking requirements | • Devices and associated vessels.<br>• Areas/locations required e.g. offsite mooring, harbour/pier facilities (timing and duration requirements for these facilities).<br>• Frequency of device off test berth including during maintenance and expected length of time at quayside.<br>• Description of activities to take place at quayside. |
| Waste minimisation and disposal | • All efforts should be made to minimise waste.<br>• Proposed waste disposal procedures.<br>• Arrangements for handling non hazardous and hazardous (special) wastes e.g. batteries, sludges, lighting units, paints, greases, oils, lubricants, solvents, coolants, sewage, domestic, scrap, packaging etc. |

# Appendix II Summary table format

## Impact summary table

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| **Identified activity** | **Prediction of potential impact** | **Potential impact significance** | **Proposed management and mitigation measures** | **Residual impact significance** |
| *Example* | | | | |
| *Device installation* | ***Damage to seabed***<br>*Survey data available to date indicated* | | *Mooring system designed* | |
| | ***Sea user interaction***<br>*Presence of XX number of vessels for a XX day period during the months of June or July 2004.* | | *Notice to mariners issued via OIC Harbours radio* | |
| *Antifoulant* | | | | |
| | | | | |

# Appendix III Summary impact matrix

Table 2.2 in the main report identifies the mechanisms by which impact may occur. The summary matrices provided in the ES should rank impacts against receptors, having considered the mechanisms by which impacts may occur.

| **Receptor** / **Activity** | Geology/ geomorphology | Sediment distribution and movement | Hydrography and hydrographic processes | Seascape/landscape | Atmosphere | Coastal species | Water column species | Seabed species | Sea mammals (inc otters) | Fish | Seabirds | Protected species and designated site | Onshore wildlife | Commercial sea and harbour users | Local economy | Other site others/developers | Recreation and amenity sea users (inc | Local residents and communities |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Construction and installation** | | | | | | | | | | | | | | | | | | |
| *Vessel presence* | | | | | | | | | | | | | | | | | | |
| *Mooring installation* | | | | | | | | | | | | | | | | | | |
| *etc* | | | | | | | | | | | | | | | | | | |
| **Device operation and maintenance** | | | | | | | | | | | | | | | | | | |
| *Removal of energy from marine environment* | | | | | | | | | | | | | | | | | | |
| *Noise emissions* | | | | | | | | | | | | | | | | | | |
| *etc* | | | | | | | | | | | | | | | | | | |
| **Accidental events** | | | | | | | | | | | | | | | | | | |
| *Oil spill* | | | | | | | | | | | | | | | | | | |
| *etc* | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

# Appendix IV Commitment table

| Issue | Commitment or action | Responsibility | Target completion date | Actual completion date | Notes |
|---|---|---|---|---|---|
| ***Examples*** | | | | | |
| *Antifoulants* | *Antifouling coatings TBT (tributylin) free* | *ABC Marine* | *29 Nov 04* | | |
| | *Antifouling to be applied to essential areas only and not over entire structure* | *ABC Marine* | *29 Nov 04* | | |
| *Paints and primers* | *All paints to confirm to BSI ???* | *ABC Marine* | *29 Nov 04* | | |
| *Decommissioning* | *Detailed decommissioning plan/procedure to be submitted to EMEC* | *ABC Marine* | *31 Dec 2004* | | |
| *Temporary mooring areas* | *Consult with OIC Harbours for temporary mooring of devices and service vessels in harbour area.* | *ABC Marine* | *15 Jan 2005* | | |
| | | | | | |
| | | | | | |